

N(1700) 3/2⁻ $I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$ Status: ***

Most of the results published before 1975 are now obsolete and have been omitted. They may be found in our 1982 edition, Physics Letters **111B** 1 (1982). Some further obsolete results published before 1984 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

The various partial-wave analyses do not agree very well.

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

NODE=B018

N(1700) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1650 to 1750 (\approx 1700) OUR ESTIMATE			
1790 ± 40	ANISOVICH	12A	DPWA Multichannel
1675 ± 25	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1731 ± 15	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1665 ± 3	SHRESTHA	12A	DPWA Multichannel
1817 ± 22	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1740 ± 20	THOMA	08	DPWA Multichannel
1736 ± 33	VRANA	00	DPWA Multichannel
1737 ± 44	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
1650	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
1690 to 1710	BAKER	78	DPWA $\pi^- p \rightarrow \Lambda K^0$
1719	BARBOUR	78	DPWA $\gamma N \rightarrow \pi N$
1670 ± 10	¹ BAKER	77	IPWA $\pi^- p \rightarrow \Lambda K^0$
1690	¹ BAKER	77	DPWA $\pi^- p \rightarrow \Lambda K^0$
1660	² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
1710	³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$

NODE=B018M

NODE=B018M

→ UNCHECKED ←

OCCUR=2

N(1700) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
100 to 250 (\approx 150) OUR ESTIMATE			
390 ± 140	ANISOVICH	12A	DPWA Multichannel
90 ± 40	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
110 ± 30	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
56 ± 8	SHRESTHA	12A	DPWA Multichannel
134 ± 37	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
180 ± 30	THOMA	08	DPWA Multichannel
175 ± 133	VRANA	00	DPWA Multichannel
250 ± 220	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
70	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
70 to 100	BAKER	78	DPWA $\pi^- p \rightarrow \Lambda K^0$
126	BARBOUR	78	DPWA $\gamma N \rightarrow \pi N$
90 ± 25	¹ BAKER	77	IPWA $\pi^- p \rightarrow \Lambda K^0$
100	¹ BAKER	77	DPWA $\pi^- p \rightarrow \Lambda K^0$
600	² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
300	³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$

NODE=B018W

NODE=B018W

→ UNCHECKED ←

OCCUR=2

N(1700) POLE POSITION

REAL PART	DOCUMENT ID	TECN	COMMENT
1650 to 1750 (\approx 1700) OUR ESTIMATE			
1770 ± 40	ANISOVICH	12A	DPWA Multichannel
1700	⁴ HOEHLER	93	SPED $\pi N \rightarrow \pi N$
1660 ± 30	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$

NODE=B018215

NODE=B018RE

NODE=B018RE

→ UNCHECKED ←

• • • We do not use the following data for averages, fits, limits, etc. • • •

1662	SHRESTHA	12A	DPWA	Multichannel
1806±23	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
1710±15	THOMA	08	DPWA	Multichannel
1704	VRANA	00	DPWA	Multichannel
not seen	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
1710 or 1678	5 LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
1616 or 1613	2 LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

-2xIMAGINARY PART

VALUE (MeV)

100 to 300 OUR ESTIMATE

420±180

120

90± 40

• • • We do not use the following data for averages, fits, limits, etc. • • •

55

129± 33

155± 25

156

not seen

607 or 567

577 or 575

	DOCUMENT ID	TECN	COMMENT
ANISOVICH	12A	DPWA	Multichannel
4 HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
SHRESTHA	12A	DPWA	Multichannel
BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
THOMA	08	DPWA	Multichannel
VRANA	00	DPWA	Multichannel
ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
5 LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
2 LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

NODE=B018IM
NODE=B018IM
→ UNCHECKED ←

N(1700) ELASTIC POLE RESIDUE

MODULUS |r|

VALUE (MeV)

5 to 50 OUR ESTIMATE

50±40

5

6± 3

• • • We do not use the following data for averages, fits, limits, etc. • • •

7

	DOCUMENT ID	TECN	COMMENT
ANISOVICH	12A	DPWA	Multichannel
HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$

NODE=B018220

NODE=B018RER
NODE=B018RER
→ UNCHECKED ←

PHASE θ

VALUE (°)

-120 to 20 OUR ESTIMATE

-100±40

0±50

• • • We do not use the following data for averages, fits, limits, etc. • • •

- 34

	DOCUMENT ID	TECN	COMMENT
ANISOVICH	12A	DPWA	Multichannel
CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$

NODE=B018IMR
NODE=B018IMR
→ UNCHECKED ←

N(1700) INELASTIC POLE RESIDUE

The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow \Delta\pi, S\text{-wave}$

MODULUS (%)

PHASE (°)

34±21 -60 ± 40

	DOCUMENT ID	TECN	COMMENT
ANISOVICH	12A	DPWA	Multichannel

NODE=B018250

NODE=B018250

NODE=B018RS1
NODE=B018RS1

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow \Delta\pi, D\text{-wave}$

MODULUS (%)

PHASE (°)

8±6 90 ± 35

	DOCUMENT ID	TECN	COMMENT
ANISOVICH	12A	DPWA	Multichannel

NODE=B018RS2
NODE=B018RS2

N(1700) DECAY MODES

The following branching fractions are our estimates, not fits or averages.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 N\pi$	(12 ± 5) %
$\Gamma_2 N\eta$	(0.0 ± 1.0) %
$\Gamma_3 \Lambda K$	< 3 %
$\Gamma_4 \Sigma K$	
$\Gamma_5 N\pi\pi$	85–95 %
$\Gamma_6 \Delta\pi$	
$\Gamma_7 \Delta(1232)\pi, S\text{-wave}$	10–90 %

NODE=B018225;NODE=B018

NODE=B018

DESIG=1;OUR EST
DESIG=2
DESIG=3;OUR EST
DESIG=4
DESIG=171;OUR EST
DESIG=181
DESIG=5;OUR EST

Γ_8	$\Delta(1232)\pi$, D-wave	< 20	%	DESIG=6
Γ_9	$N\rho$	< 35	%	DESIG=182;OUR EST
Γ_{10}	$N\rho$, S=1/2, D-wave			DESIG=7
Γ_{11}	$N\rho$, S=3/2, S-wave	(7.0±1.0)	%	DESIG=8
Γ_{12}	$N\rho$, S=3/2, D-wave			DESIG=9
Γ_{13}	$N(\pi\pi)_{S\text{-wave}}^{I=0}$			DESIG=10
Γ_{14}	$p\gamma$	0.01–0.05	%	DESIG=184;OUR EST
Γ_{15}	$p\gamma$, helicity=1/2	0.0–0.024	%	DESIG=11;OUR EST
Γ_{16}	$p\gamma$, helicity=3/2	0.002–0.026	%	DESIG=12;OUR EST
Γ_{17}	$n\gamma$	0.01–0.13	%	DESIG=185;OUR EST
Γ_{18}	$n\gamma$, helicity=1/2	0.0–0.09	%	DESIG=13;OUR EST
Γ_{19}	$n\gamma$, helicity=3/2	0.01–0.05	%	DESIG=14;OUR EST

N(1700) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
12 ±5 OUR ESTIMATE				
12 ±5	ANISOVICH	12A	DPWA Multichannel	
11 ±5	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$	
8 ±3	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.8±0.5	SHRESTHA	12A	DPWA Multichannel	
9 ±6	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$	
8 +8 -4	THOMA	08	DPWA Multichannel	
4 ±2	VRANA	00	DPWA Multichannel	
1 ±2	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$	

$\Gamma(N\eta)/\Gamma_{\text{total}}$

VALUE (%)	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
0±1	VRANA	00	DPWA Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
14±5	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$	
10±5	THOMA	08	DPWA Multichannel	

$(\Gamma_f/\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1700) \rightarrow \Lambda K$

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$
-0.06 to +0.04 OUR ESTIMATE				
-0.012	BELL	83	DPWA $\pi^- p \rightarrow \Lambda K^0$	
-0.012	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.04	BAKER	78	DPWA See SAXON 80	
-0.03 ±0.004	BAKER	77	IPWA $\pi^- p \rightarrow \Lambda K^0$	
-0.03	BAKER	77	DPWA $\pi^- p \rightarrow \Lambda K^0$	
+0.026±0.019	DEVENISH	74B	Fixed-t dispersion rel.	

$(\Gamma_f/\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1700) \rightarrow \Sigma K$

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	LIVANOS	80	DPWA $\pi p \rightarrow \Sigma K$	
<0.017	DEANS	75	DPWA $\pi N \rightarrow \Sigma K$	

Note: Signs of couplings from $\pi N \rightarrow N\pi\pi$ analyses were changed in the 1986 edition to agree with the baryon-first convention; the overall phase ambiguity is resolved by choosing a negative sign for the $\Delta(1620)$ S_{31} coupling to $\Delta(1232)\pi$.

NODE=B018230

NODE=B018R1
NODE=B018R1
→ UNCHECKED ←

NODE=B018R10
NODE=B018R10

NODE=B018R3
NODE=B018R3
→ UNCHECKED ←

OCCUR=2

NODE=B018R4
NODE=B018R4

NODE=B018310

NODE=B018R5
NODE=B018R5

VALUE	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1\Gamma_7)^{1/2}/\Gamma$
0.00	LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$	
-0.16	LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.02±0.03	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$	

$\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)

10 to 90 OUR ESTIMATE

72 ± 23	ANISOVICH	12A	DPWA	Multichannel
11 ± 1	VRANA	00	DPWA	Multichannel
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
31 ± 9	SHRESTHA	12A	DPWA	Multichannel
10 ± 5	THOMA	08	DPWA	Multichannel

 Γ_7/Γ

NODE=B018R13
NODE=B018R13
→ UNCHECKED ←

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } N\pi \rightarrow N(1700) \rightarrow \Delta(1232)\pi, D\text{-wave}$

VALUE

DOCUMENT ID	TECN	COMMENT
² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$		
$+0.10 \pm 0.09$	MANLEY	92 IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

NODE=B018R6
NODE=B018R6

 $\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)

<20 OUR ESTIMATE

<10	ANISOVICH	12A	DPWA	Multichannel
79 ± 56	VRANA	00	DPWA	Multichannel
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
3 ± 2	SHRESTHA	12A	DPWA	Multichannel
20 ± 11	THOMA	08	DPWA	Multichannel

 Γ_8/Γ

NODE=B018R12
NODE=B018R12
→ UNCHECKED ←

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } N\pi \rightarrow N(1700) \rightarrow N\rho, S=3/2, S\text{-wave}$

VALUE

 ± 0.01 to ± 0.13 OUR ESTIMATE

DOCUMENT ID	TECN	COMMENT
² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$		
-0.04 ± 0.06	MANLEY	92 IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

NODE=B018R7
NODE=B018R7
→ UNCHECKED ←

 $\Gamma(N\rho, S=3/2, S\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)

7±1

7 ± 1	VRANA	00	DPWA	Multichannel
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
38 ± 6	SHRESTHA	12A	DPWA	Multichannel

 Γ_{11}/Γ

NODE=B018R11
NODE=B018R11

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } N\pi \rightarrow N(1700) \rightarrow N(\pi\pi)_{S\text{-wave}}^{I=0}$

VALUE

 ± 0.02 to ± 0.28 OUR ESTIMATE

DOCUMENT ID	TECN	COMMENT
² LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
³ LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$		
$+0.02 \pm 0.02$	MANLEY	92 IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

NODE=B018R8
NODE=B018R8
→ UNCHECKED ←

 $\Gamma(N(\pi\pi)_{S\text{-wave}}^{I=0})/\Gamma_{\text{total}}$

VALUE (%)

0±1

0 ± 1	VRANA	00	DPWA	Multichannel
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
24 ± 6	SHRESTHA	12A	DPWA	Multichannel
18 ± 12	THOMA	08	DPWA	Multichannel

 Γ_{13}/Γ

NODE=B018R14
NODE=B018R14

N(1700) PHOTON DECAY AMPLITUDES

NODE=B018235

Papers on γN amplitudes predating 1981 may be found in our 2006 edition,
Journal of Physics, G **33** 1 (2006).

NODE=B018235

 $N(1700) \rightarrow p\gamma, \text{ helicity-1/2 amplitude } A_{1/2}$ VALUE (GeV $^{-1/2}$) **-0.018 ± 0.013 OUR ESTIMATE**

DOCUMENT ID	TECN	COMMENT
0.041 ± 0.017	ANISOVICH	12A DPWA Multichannel
-0.016 ± 0.014	CRAWFORD	83 IPWA $\gamma N \rightarrow \pi N$
-0.002 ± 0.013	AWAJI	81 DPWA $\gamma N \rightarrow \pi N$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$		
0.021 ± 0.005	SHRESTHA	12A DPWA Multichannel
-0.033 ± 0.021	BARBOUR	78 DPWA $\gamma N \rightarrow \pi N$

NODE=B018A1
NODE=B018A1
→ UNCHECKED ←

N(1700) → pγ, helicity-3/2 amplitude A_{3/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
-0.002±0.024 OUR ESTIMATE			
-0.034±0.013	ANISOVICH	12A	DPWA Multichannel
-0.009±0.012	CRAWFORD	83	IPWA $\gamma N \rightarrow \pi N$
0.029±0.014	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.050±0.009	SHRESTHA	12A	DPWA Multichannel
-0.014±0.025	BARBOUR	78	DPWA $\gamma N \rightarrow \pi N$

NODE=B018A2
NODE=B018A2
→ UNCHECKED ←

N(1700) → nγ, helicity-1/2 amplitude A_{1/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
0.000±0.050 OUR ESTIMATE			
0.006±0.024	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
-0.002±0.013	FUJII	81	DPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.049±0.008	SHRESTHA	12A	DPWA Multichannel
+0.050±0.042	BARBOUR	78	DPWA $\gamma N \rightarrow \pi N$

NODE=B018A3
NODE=B018A3
→ UNCHECKED ←

N(1700) → nγ, helicity-3/2 amplitude A_{3/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
-0.003±0.044 OUR ESTIMATE			
-0.033±0.017	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
0.018±0.018	FUJII	81	DPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.092±0.014	SHRESTHA	12A	DPWA Multichannel
+0.035±0.030	BARBOUR	78	DPWA $\gamma N \rightarrow \pi N$

NODE=B018A4
NODE=B018A4
→ UNCHECKED ←

N(1700) pγ → ΛK⁺ AMPLITUDES

(Γ _i Γ _f) ^{1/2} /Γ _{total} in pγ → N(1700) → ΛK ⁺	DOCUMENT ID	TECN	(E ₂₋ amplitude)
VALUE (units 10 ⁻³)			
4.09	TANABE	89	DPWA

NODE=B018240

(Γ _i Γ _f) ^{1/2} /Γ _{total} in pγ → N(1700) → ΛK ⁺	DOCUMENT ID	TECN	(M ₂₋ amplitude)
VALUE (units 10 ⁻³)			
-7.09	TANABE	89	DPWA

NODE=B018LK1
NODE=B018LK1

NODE=B018LK2
NODE=B018LK2

pγ → N(1700) → ΛK ⁺ phase angle θ	DOCUMENT ID	TECN	(E ₂₋ amplitude)
VALUE (degrees)			
-35.9	TANABE	89	DPWA

NODE=B018LP1
NODE=B018LP1

N(1700) FOOTNOTES

- 1 The two BAKER 77 entries are from an IPWA using the Barrelet-zero method and from a conventional energy-dependent analysis.
- 2 LONGACRE 77 pole positions are from a search for poles in the unitarized T-matrix; the first (second) value uses, in addition to $\pi N \rightarrow N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis. The other LONGACRE 77 values are from eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
- 3 From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
- 4 See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of N and Δ resonances as determined from Argand diagrams of πN elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.
- 5 LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to $\pi N \rightarrow N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.
- 6 The overall phase of BAKER 78 couplings has been changed to agree with previous conventions.
- 7 The range given is from the four best solutions.

NODE=B018
NODE=B018;LINKAGE=B
NODE=B018;LINKAGE=L7
NODE=B018;LINKAGE=L5
NODE=B010;LINKAGE=H9
NODE=B018;LINKAGE=L8
NODE=B018;LINKAGE=F
NODE=B018;LINKAGE=G

N(1700) REFERENCESFor early references, see Physics Letters **111B** 1 (1982).

NODE=B018

NODE=B018

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)	REFID=54041
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)	REFID=54862
BATINIC	10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)	REFID=53552
THOMA	08	PL B659 87	U. Thoma <i>et al.</i>	(CB-ELSA Collab.)	REFID=52087
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)	REFID=51535
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)	REFID=51004
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman,, T.-S.H. Lee	(PITT+)	REFID=47593
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)	REFID=43821
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA) IJP	REFID=41535
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)	REFID=30071
ARNDT	91	PR D43 2131	R.A. Arndt <i>et al.</i>	(VPI, TELE) IJP	REFID=41467
TANABE	89	PR C39 741	H. Tanabe, M. Kohno, C. Bennhold	(MANZ)	REFID=40997
Also		NC 102A 193	M. Kohno, H. Tanabe, C. Bennhold	(MANZ)	REFID=40998
BELL	83	NP B222 389	K.W. Bell <i>et al.</i>	(RL) IJP	REFID=30409
CRAWFORD	83	NP B211 1	R.L. Crawford, W.T. Morton	(GLAS)	REFID=30070
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)	REFID=41167
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)	REFID=30067
Also		NP B197 365	K. Fujii <i>et al.</i>	(NAGO)	REFID=30068
FUJII	81	NP B187 53	K. Fujii <i>et al.</i>	(NAGO, OSAK)	REFID=30069
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=30064
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP	REFID=40096
LIVANOS	80	Toronto Conf. 35	P. Livanos <i>et al.</i>	(SACL) IJP	REFID=30402
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP	REFID=30404
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP	REFID=30058
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP	REFID=30859
BAKER	78	NP B141 29	R.D. Baker <i>et al.</i>	(RL, CAVE) IJP	REFID=30391
BARBOUR	78	NP B141 253	I.M. Barbour, R.L. Crawford, N.H. Parsons	(GLAS)	REFID=30053
LONGACRE	78	PR D17 1795	R.S. Longacre <i>et al.</i>	(LBL, SLAC)	REFID=30054
BAKER	77	NP B126 365	R.D. Baker <i>et al.</i>	(RHEL) IJP	REFID=30388
LONGACRE	77	NP B122 493	R.S. Longacre, J. Dolbeau	(SACL) IJP	REFID=30051
Also		NP B108 365	J. Dolbeau <i>et al.</i>	(SACL) IJP	REFID=30052
DEANS	75	NP B96 90	S.R. Deans <i>et al.</i>	(SFLA, ALAH) IJP	REFID=30383
LONGACRE	75	PL 55B 415	R.S. Longacre <i>et al.</i>	(LBL, SLAC) IJP	REFID=30047
DEVENISH	74B	NP B81 330	R.C.E. Devenish, C.D. Froggatt, B.R. Martin	(DESY+)	REFID=30036